

SEISMIC DISCRIMINATION OF RECENT INDIAN AND PAKISTANI NUCLEAR TESTS WITH SHORT-PERIOD AMPLITUDE RATIOS

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The recent Indian and Pakistani nuclear tests provide new calibration data for testing short-period seismic discrimination strategies. We measured amplitudes of regional and upper mantle phases for the tests and many earthquakes recorded at stations NIL (Nilore, Pakistan) and AAK (Ala Archa, Kyrgyzstan). For the Indian test recorded at NIL, phase ratios such as Pn/Lg and Pn/Sn show promise of discrimination even at relatively low frequencies (0.5-2 Hz). This observation differs from previous results which report poor separation of earthquakes and explosions at lower frequencies and better separation at higher frequencies. Spectral and cross-spectral ratios show a strong distance and magnitude dependence that arises from source size-corner frequency scaling and differential attenuation. We developed a simple procedure for modeling the distance and magnitude dependence of spectral ratios and applied it to the NIL data. Results show that the distance and magnitude corrections improve the discrimination of the Indian test for the spectral and cross-spectral ratio data. Path propagation effects on regional phases (e.g. attenuation and crustal waveguide heterogeneity) result in lateral variations of discriminants beyond simple distance trends. We show that accounting for path effects with Bayesian kriging can significantly improve discrimination performance. These correction procedures lead to more normally distributed discriminants for input into multivariate discrimination algorithms which we are using to further analyze the NIL data. The Indian and Pakistani tests and adjacent earthquakes were recorded at upper mantle distances at station AAK. These tests do not discriminate well from nearby earthquakes when amplitudes are measured using standard procedures for regional data ($\Delta < 1500$ km). At these distances P and S body-wave arrivals are composed of interfering upper mantle triplication arrivals. We are investigating strategies for improving discrimination in the upper mantle distance range.

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3. Special Session - CTBT research and its role in earthquake studies

4. Oral presentation preferred

5. No special equipment needed